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Plant Medicines at Your Doorstep

Harry Foster

foxglove

In this age of specialization, technology and universal health care, most of us know little about home remedies, and the uses of medicinal herbs and plants. In spite of the large number of synthetic, highly purified chemicals that are available for medicinal purposes, at least 25 percent of present-day medicines are still derived from plants and another 15 percent from the culture of microorganisms. Clearcutting for agriculture and lumbering results in the loss of vast areas of tropical rain forest every year and the extinction of thousands of organisms, many of which are plants as yet unknown to science. How many of these might possess potential medicines and cures for human diseases?

Our concern not only for the environment but also for our own well-being is becoming increasingly evident. We live in a world where the air we breathe, the water we drink and the plants and animals we eat are daily becoming more polluted by agents that cause bodily stress and illness. Health food stores cater to our desires for naturally grown vegetables and fruits, unadulterated by chemical fertilizers and pesticides, and for herbs and natural body care products. Numerous books on nutrition, healthy lifestyles, herbalism, and edible and medicinal plants fill the bookstores.

Mildred McPhee

common dandelion

The following is but a brief introduction to a few common plants of gardens, fields and woodlands that are known to have some medicinal uses. Although diagnosis and treatment for real or presumed illnesses is best left to a trained physician, it is nevertheless gratifying to be able to identify a local plant using a popular field guide and to learn something practical about its historical use. If tempted to use plants as dietary supplements or for medicinal purposes, be certain that you have correctly identified the plant, know all of its properties, and have obtained it from an area where no pesticides or noxious chemicals have been sprayed. You should also remember that any plant substance may cause an allergic reaction in some people if taken internally or applied externally.

Medicines in the Garden

The common dandelion (*Taraxacum officinalis*) is one of the most widespread of all plants introduced from the Old World. Its long history of use as a medicinal plant is reflected in the second part of its botanical name. Many plants that were used widely for medicinal purposes by medieval apothecarists were given the descriptive epithet "officinalis," meaning "of the [apothecary] shops." Dandelions are high in vitamins A and C. The young leaves were eaten raw or cooked as early spring greens, and the roots were used to brew a coffee-like drink that stimulates the kidneys. Common names for dandelion, such as the French *pissenlit* (piss-in-bed), reflect the diuretic properties of the plant. Dandelion tea made from dried leaves is also a mild laxative, and the flower heads have long been used to make dandelion wine.

Common plantain (*Plantago major*), that broad-leaved Eurasian exotic, denizen of poorly kept lawns, roadsides and waste places, followed early settlers wherever they went. In the late 1600s, Indians of Virginia called the plant Englishman's-foot. Several species of plantains have become naturalized throughout temperate North America, growing everywhere as if they were a natural part of the flora. All have similar medicinal properties. Because the leaves contain considerable tannin, crushed fresh leaves were used for dressing wounds: the astringent qualities of tannin helps to stop bleeding. The crushed leaves were also used to relieve the itch and inflammation from nettle and insect stings. A tea made from the seeds, which have a high mucilage content, was a useful remedy for diarrhoea.

One of the loveliest and most important medicinal plants found in some gardens is foxglove (*Digitalis purpurea*). This biennial plant forms a rosette of long-stalked leaves during the first year, then overwinters and flowers the second. The use of its powdered leaves as an invaluable heart stimulant, still practised today, was established by the English physician William Withering. In 1775, an old Shropshire woman practising herbal medicine cured one of the doctor's patients of excess fluid retention, caused by congestive heart failure, with plants gathered in the countryside. Over the next 10 years Withering experimented with foxglove, one of the plants she used, to determine the correct dosage for medical treatment. This careful study was important because foxglove is highly poisonous if its leaves are chewed and swallowed. Paralysis and heart failure may result.

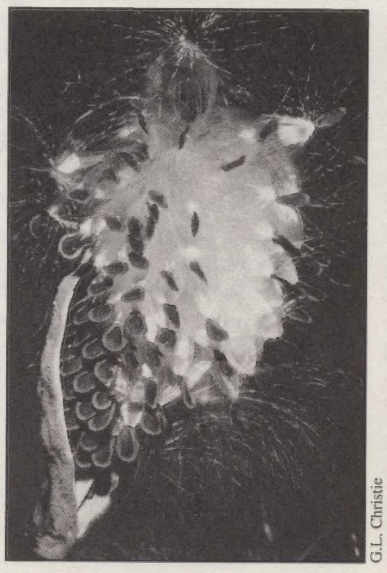
Not as showy as foxglove, but perhaps much more common in neighbourhood gardens, is lily of the valley (*Convallaria majalis*). This European perennial, commonly planted in shaded flower beds, spreads readily by its creeping underground stems. Its fragrant, white, bell-shaped flowers, arranged in a one-sided cluster, have long been associated with the Virgin Mary and were commonly used in wedding bouquets. Herbalists also used this plant for the treatment of heart ailments. Although lily of the valley is not as potent as foxglove, it is also considered a poisonous plant.

Further Afield in Search of Medicines

Herbalists and native peoples have used as medicines many common plants, both native and introduced from other parts of the world, that are found in abandoned farmers' fields, hedgerows and woodlands.

The common milkweed (*Asclepias syriaca*), a plant of abandoned fields and pastures whose nubby pods split open in late summer to release their parachuted seeds, has many uses. The young flowering shoots and pods can be boiled and eaten as a vegetable. The silky down of the seeds was once used to stuff beds, pillows and life jackets. In folk medicines, the white sap was used as a treatment for skin problems and warts, and the poisonous roots to cure various bowel and kidney disorders or to treat respiratory diseases.

The tall dense wands of yellow mullein flowers (*Verbascum thapsus*), commonly reaching to two metres tall, stand out prominently in fields and pastures. The stems of the plant are clothed in large broad downy leaves. It is a biennial weed introduced from Europe that has found its way across temperate North America. In Europe, it has been used since ancient times for medicinal purposes. A tea made from the leaves or flowers was used as a remedy for chest colds, bronchitis and asthma and the leaves were smoked in herbal tobaccos as a cough remedy. The hairy leaves were also used as a cosmetic replacement for rouge. A leaf rubbed over the



G.L. Christie

common milkweed

(continued on page 4)

P. Horne

A giant, 3000-year-old dragon tree at Icod, Tenerife, Canary Islands.

Dragon's Blood and Mummies: Modern Science Unravels Ancient Mysteries

Looking like stage props from a Gothic horror play, the dragon trees (*Dracaena draco*) of the Canary Islands are giant members of the lily family. In ancient times, it was believed that the red resin these trees produced was congealed 'blood' resulting from a nasty dragon seeking revenge on an elephant. Until the last century, Dragon's Blood resin was highly valued as a cure-all remedy and as a stain for woodwork and marble. The inhabitants of the Canaries, the Guanche (pronounced 'guän,chā), also used it when mummifying the bodies of aristocrats.

The Guanche inhabited the Canary Islands for many centuries but vanished shortly after the Spanish conquest in the mid-15th century. It is reported that at the time thousands of mummies were stored in great mortuary caves. Alas! Medieval Europe was a voracious market for powdered mummies, so shiploads of Guanche (and Egyptian) mummies were sent off to stock the shelves of Europe's apothecaries and alchemists. Today fewer than 34 intact mummies remain on the Islands and a few more are held in museums around the world. With so little known of the Guanche, a concerted effort has been made during the past two years to study these mummies.

Recently, one of us (P.H.) was granted permission to examine North America's only Guanche, held in the collections of the Redpath Museum, McGill University, Montreal. With the preservation of the mummy of foremost concern, the examination was conducted under the watchful eye of the Curator of Ethnology, Barbara Lawson.

Such examinations fall under paleopathology — the science of the diseases evident in people and animals of ancient times. A society's diseases reflect its general conditions and growth and, therefore, offers valuable clues to understanding the society as a whole.

To obtain the maximum amount of information with as little damage as possible, these examinations require a multidisciplinary approach. Scientists from several unrelated fields help piece together the many bits of the ancient puzzle.

In the case of the Redpath mummy, small samples were removed from the skin and bone. Samples of goat skin, in which the largely skeletal remains were wrapped, were also taken. Samples of associated debris from the abdominal area later proved a gold mine of information.

The samples of abdominal contents, composed mainly of plant remains, were forwarded to the Canadian Museum of Nature. Robert Ireland, bryologist at the Museum, identified a moss, *Neckera intermedia*, a large, distinctive species confined to the Canary and Madeira Islands, the Azores and Spain. The moss was apparently used to pad out the body following evisceration of the abdominal contents.

The remainder of the abdominal material was processed and examined microscopically for the presence of pollen and spores. Palynology, the study of fossil pollen and spores, has long provided important clues to the habits and habitats of ancient people. Pollen in soils excavated from archaeological sites tells us much about the flora at the time of the site's occupation. Pollen and plant remains from the intestinal contents of mummies and from isolated coprolites (mummified faeces) are the most direct evidence we have of the composition of ancient diets.

Spores of ferns and fern allies, algae and fungi elements were abundant in these samples. The pollen represented several members of the daisy family along with grasses and plants of the lily family. It cannot be ascertained if the lily pollen was produced by the dragon tree, but it seems likely. Pine pollen was also prominent in the samples. We know from written records that Canary Islands pine was used in mummification.

Dr. Patrick Horne examining the McGill University Guanche mummy at the Redpath Museum.

X-rays of the bone samples were carried out at Montreal's Royal Victoria Hospital. X-rays tell us many of the same things they do for present-day patients but with the added bonus of providing clues as to the age and sex of the individual. Chemists from the University of Minnesota also analysed the bone samples for clues about the Guanche's diet. Some of the other specialists examined the skin samples; physicists used radiocarbon techniques to date the goat skin wrappings to around 1400 years before the present. A forensic entomologist at the University of Cambridge studied insect pupae inside the wrappings. Insects associated with a corpse provide clues to the circumstances of the individual's death and what happened to the body thereafter. All these clues are as valuable to the paleopathologist as to any modern-day police force.

These are only a few of the many specialists who contributed to an understanding of the Guanche lifestyle and their diseases which to some, perhaps, is a rather morbid and strange endeavour. Pliny the Elder (?23-79 A.D.), the great Roman scientist and encyclopedist and one of the first to write about the fanciful origins of Dragon's Blood in his *Natural History*, wrote "It is an arduous task to give novelty to what is ancient, authority to what is new, interest to what is obsolete, light to what is loathsome, and credit to what is dubious." Science has indeed come a long way!

Patrick Horne
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and
David M. Jarzen
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Editor's note: Patrick Horne is Supervisor of Pathology of York County Hospital. He is one of the 11 founding members of the International Paleopathology Association and has examined mummies of various cultures on three continents.

From the Director's Desk:

Museums, Natural History Collections, and Society

It is not enough just to do a good job. Museums must do things for which people are willing to pay. Most of the reasons museums exist today are the same as before: symbols of wealth, power, and knowledge. Today, however, they are also sources of knowledge, so they are actually tools of power as well as symbols. The natural history collections of the world are a critical resource in the development of knowledge. They are important as an historical record of what was present in a given location in ancient or recent times. Data associated with them represent a catalogue of the context for the existence of the species, or its relationship to others. Based on the discoveries that are made with these specimens, we can develop the capacity to predict the future. The world is about to face a serious environmental crisis, one which may have parallels in ancient times, with significant loss of species. To be able to predict when the ecological damage is sufficient to cause distress to humans, or to be able to predict when the climatic change will be sufficient to alter the growing capacities of agricultural regions, would be an incalculably valuable asset. It is only possible to achieve this capacity with the assistance of major natural history collections. Unfortunately, the signal importance of this asset is not appreciated by enough people to ensure the continued safety of the collections of the world. In simple terms, a hugely valuable resource which will be critical to the survival of human beings in the not-too-distant future, and which has immense social and heritage value, is in serious danger of being destroyed.

Museums can no longer rely on the philosophical position that they need only be bastions of truth and symbols of heritage. If museums try to keep these as their sole reason for existence, they will gradually wither and die. The modern natural history museum must be a centre of active, leading-edge research relevant to and engaged in work of relevance and interest to society. To be seen as having value, museums must provide services and products that are valued by the entire community. For natural history museums to succeed in the next several decades, it will be necessary to have a coherent understanding of the overall mission of museums. Just because museums traditionally have been the result of collections does not automatically mean they will continue to be the result of collections. Increasingly they are seen as business operations in the education and entertainment industry. This aspect can be used to enhance, maintain and promulgate the more fundamental role of maintaining a vast resource of materials from which the museum can derive information through research that will help solve the world's growing cultural and environmental problems. But this can only be done through an honest and hard-headed analysis of where we are today, and where society wants us to be in the future. That analysis must be used to place museums actively in leading, forward-looking positions. Museums must be participants defining and creating the future for society.

Alan R. Emery
Director

B I O M E

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Museum Scientist Awarded the Massey Medal

Editor's note: part of the following has been adapted from an article that appeared in BIOME Vol. 8:1. Stewart MacDonald is also featured in the May-June issue of Canadian Geographic.

Stewart D. MacDonald, the Museum's Curator Emeritus of Ethology, will be presented with the prestigious Massey Medal for 1992, awarded by the Royal Canadian Geographical Society in Ottawa.

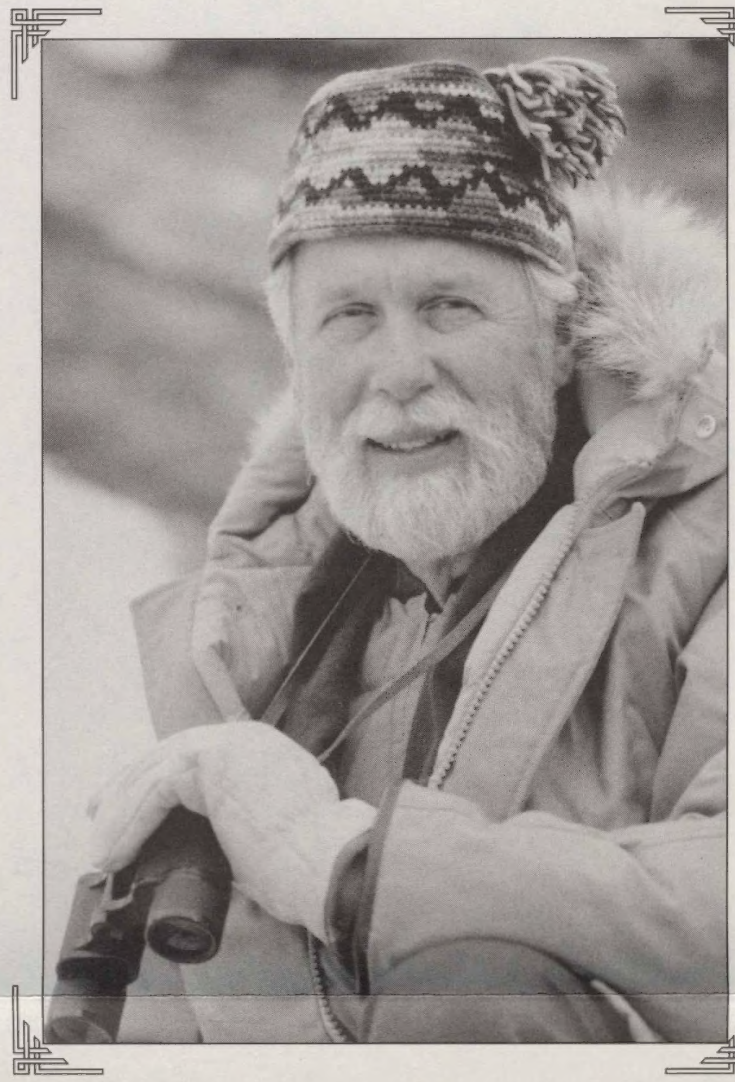
Forty-four years ago, at the age of 20, MacDonald left his native Nova Scotia to work as a technician for the National Museum in Ottawa. In 1949 he joined a small expedition to Prince Patrick Island in the Arctic Archipelago. Here he discovered the lure of the 'Far North.'

He returned to the Arctic several times over the next five years, taking part in the first detailed studies of the ecology and distribution of northern breeding birds. During these years, MacDonald had gone back to school part-time and was juggling a busy research schedule with academic work. He resumed university studies full-time in 1956.

When he rejoined the Museum as Assistant Curator of Birds in 1959, he began research on animal behaviour, specializing in the territorial behaviour and mating displays of grouse. Bathurst Island had never been explored by zoologists; so, in 1968, MacDonald led a six-man research team there for three months. The team established a field station at Polar Bear Pass and began the first comprehensive long-term studies of arctic wildlife. MacDonald has returned to Polar Bear Pass 18 times since that first expedition.

In 1972, MacDonald headed south for a change — to Antarctica — at the invitation of the National Science Foundation. For three months he studied birds of the ice-pack ecosystem in the Weddell Sea. This excursion gave MacDonald fresh insight on arctic birds. When he returned to the North the following year, he established new nesting records for the rare Ivory Gull based on his observations of several species of petrels in Antarctica.

MacDonald had long since realized the fragility and uncertain future of Polar Bear Pass. His concern for the Arctic led him to ask the UNESCO-based International Biological Programme to designate the valley an area of special ecological significance. He also wanted to reach the public and the politicians. "I was determined to get people down south to look at the Arctic as something other than desolation," says MacDonald. In 1976 he assembled a stunning show of his photographs. *An Arctic Oasis* became the Museum's most popular travelling exhibition and thousands of people wrote letters to show their support for the preservation of Polar Bear Pass.



Sandy MacDonald

In 1986, MacDonald's determination finally resulted in permanent protection for Polar Bear Pass, which was established as the first National Wildlife Area in Canada's Arctic. The Honourable Tom McMillan, then Minister of the Environment, noted that "The major share of the credit goes to Stewart MacDonald. The Wildlife Area at Polar Bear Pass has been a dream of his for nearly two decades, and the fact that it has become a reality owes a great deal to his unceasing efforts."

Stewart MacDonald is being recognized by the Royal Canadian Geographical Society for his major contributions to knowledge and conservation in the Canadian North. Dr. Alan Emery, Director of the Canadian Museum of Nature, notes that by being awarded the Massey Medal, MacDonald "...is recognized as having contributed to the world's fundamental understanding and appreciation of the arctic environment, its immense beauty, fragility, and signal importance to society. We are proud to see Stewart recognized and to think that we at the Museum may have played a part in enabling him to become profoundly aware of the natural world. We salute the wisdom and strength he has shown in exploring and defending nature."

Museum Archives

Canadian Museum of Nature

The Museum Library in 1941 (we've changed quite a bit since then).

Museums function as the collectors, researchers and interpreters for a community. While each museum may have different priorities, in general they all house and preserve collections of artifacts or specimens. Each museum strives to perform innovative research and offers interpretations of its knowledge through publications, exhibitions and educational programmes. The museum thus enables the community to better understand its heritage as well as the physical environment of the past and present.

Who then documents the past and present of the museum as an institution? An institutional archives serves as the collective memory of the museum. It is a repository for non-current unpublished records. An archivist seeks to acquire the appropriate documentation for the archival collection using the collections documentation strategy established by the museum. An archival collection, like the specimen or artifact collections of the museum, offers insight into past and present activity and thus deserves preservation.

The archivist is not unlike the museum curator who seeks to collect and protect material because of its value for research and educational purposes. While curators acquire objects and associated documentation that may enhance research findings, archivists selectively choose records that piece together the history of the organization and its various activities.

Just what kinds of records are kept in a museum archives? Exhibit reports, committee minutes, museum policies, research reports, field notes, visitor surveys, exhibit posters, items of correspondence, photographs, personal papers of past directors and scientists. Records generated by museum staff provide information on the role of the museum in different areas. Various documents demonstrate important museum transactions and significant administrative decisions that may have an effect on the research, collection, publishing or exhibit activities of the museum. For example, the records pertaining to the topics of travelling exhibits in a three-year period may demonstrate the museum's decision to focus on environmental concerns.

The Canadian Museum of Nature (CMN) has recently established its own institutional archives. The CMN has had an in-house records system since the early 1970s. But the Museum recognizes the need for a permanent repository of records and has added an archives component to its library. The CMN Library and Archives is now organizing its archival materials and, because of the overwhelming support and cooperation from CMN management, scientists and other staff, envisions a successful and wealthy Museum archival collection that will soon be accessible to researchers.

Shelley McKellar
Scientific Information and
Coordination Division

Zeolites: The Friendly Minerals

The connection between kitty litter, blood dialysis, chicken feed, petroleum processing and solar power may seem obscure, but the fact is, all of these can involve zeolites — a revolutionary group of industrial minerals.

There are approximately 40 naturally occurring mineral species in the zeolite group. In addition, there are about 150 zeolites synthetically produced for specific uses. Zeolites owe their uniqueness not to their very simple chemistry or to their rather restricted geological association but to the complex arrangement of atoms in their crystal structure.

Zeolite: The Stone that Boils

In 1756 Freiherr Axel Fredrick Cronstedt, a Swedish mineralogist, subjected a number of crystals to the heat of a blowpipe and noted their peculiar frothing characteristics. He named these minerals zeolites, from the Greek word for boiling stones.

The fascinating boiling feature of zeolites results from their unique, porous crystal structure. Unlike other crystal structures, the silica framework has cages or holes large enough to accommodate ions of calcium, sodium and potassium or a molecule of water. The zeolitic water may be easily driven off with a little heat. This leaves voids in the crystal structure, which lead to some important applications for these minerals. This honeycomb of cavities and channels may occupy as much as 50 per cent of a zeolite's volume. In one gram of zeolite, the channels provide up to several hundred square meters of surface area on which chemical reactions can take place.

Zeolites are used mainly for molecular sieving and ion exchange. In sieving, the open channels hold back molecules that are too large to pass. This is how nitrogen, carbon dioxide and sulphur dioxide are removed from oxygen to purify air. The ion-exchange property is effected by the atomic cages in the crystal structure, which trap noxious substances. This method is used to combat ammonia, which accumulates in the water of fish spawning tanks.

In each type of zeolite the channels and holes in the sponge-like structure are the same size and shape. This uniformity of crystal structure is critical to a selective chemical process. In petroleum refining the geometry of the zeolite cavities is such that molecules of a particular size and shape are sucked into proximity of each other and forced to react chemically — this is called catalytic cracking — a process necessary to produce gasoline.

Although the petroleum industry uses synthetic zeolites, there is an ever-increasing number of applications for natural zeolites. If mined on a large scale, natural zeolites would be much cheaper to process. These minerals are particularly suited to 'friendly uses' in agriculture and environmental protection.

For years farmers have been adding zeolites to experimental diets to increase weight gain in pigs and chickens at a lower cost of feed. In cows, zeolites control unhealthy ammonia levels in the rumen (first stomach). Zeolites can also improve the quality of agricultural land by conditioning acidic, sandy soils and by retaining important crop nutrients such as potassium and nitrates and preventing these ions from leaching into our river systems.

Environmental uses of naturally occurring zeolites include absorption of radioactive ions at nuclear fuel plants and atomic energy stations. They also trap heavy metals such as zinc, mercury, lead and cadmium from industrial and mining wastes. With these newly developed applications of zeolite minerals, it has become important to find deposits of them to meet the ever-increasing demand.

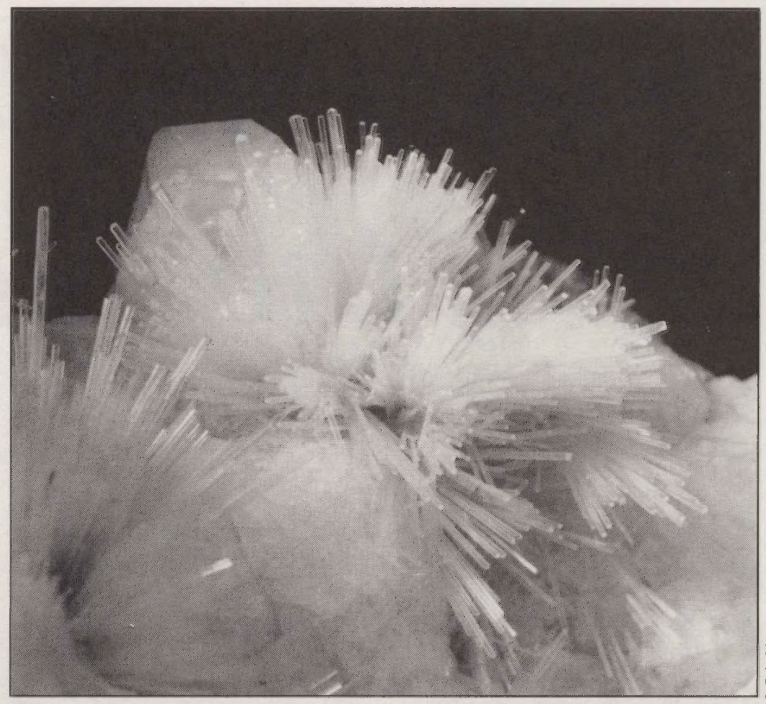
Zeolite Deposits in Canada

Zeolites were recognized in the cavities of the volcanic basalts along the Bay of Fundy, Nova Scotia, as early as 1829. In fact, an orange-coloured variety of the zeolite mineral chabazite was thought to be a new mineral and was named 'acadialite' for the Acadians who lived in this area until the mid-18th century. Although there are significant quantities of zeolites in these basaltic lava flows there are insufficient concentrations to be mined economically. Also, there is a wide variety of species of zeolite contained within these rocks, some of which are unsuitable for commercial use.

It was not until the mid-1980s that other possible sources of zeolite deposits were found. This time it was on the other side of Canada, in the low-lying mountains and plateaus of south-central British Columbia. The exposed volcanic rocks in these areas are approximately 40 million years old. The rocks containing zeolites are very plain in appearance, in fact so unnotable that identification was difficult, hence their late discovery. These very-fine grained, beige- to grey-coloured rocks were originally volcanic ash that settled from the air as a sediment and subsequently crystallized in the presence of water into the zeolite mineral clinoptilolite.

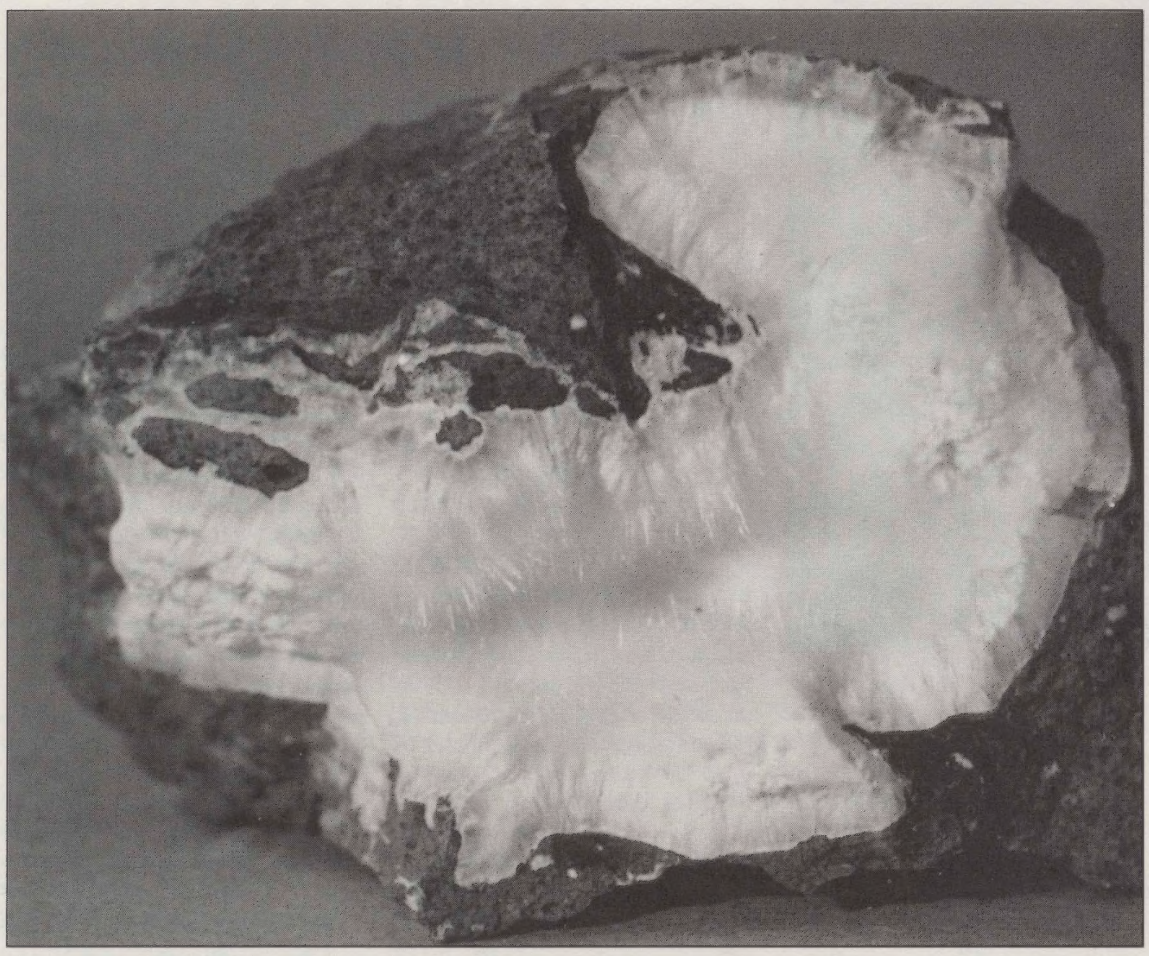
These sedimentary zeolite layers in British Columbia are up to several metres thick and in some areas extend for a few kilometres. They are similar to deposits in the United States, Australia, Italy and Japan that are being mined for use in agriculture, industry and construction. At present zeolite occurrences at Cache Creek and Princeton, B.C. are being investigated for similar development.

Joel D. Grice
Research Division



J. Schekkerman

A spray of white natrolite crystals, each approximately 1 cm long, from the Bay of Fundy, Nova Scotia.

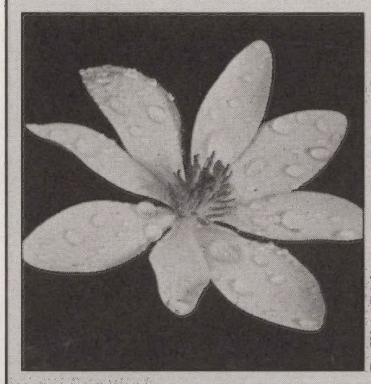


J. Schekkerman

Needles of the zeolite mineral mesolite in a cavity within basalt rock.

(continued from page 1)

cheeks would bring a glow to the face. Leaves were even placed in shoes as a 'felt' lining during winter months. Beginning in Roman times, the yellow dye extracted from the flowers was used as a hair rinse.



Dr. W.A. Crich

bloodroot

The mention of raspberries (*Rubus* species) brings to mind juicy thimbles of red fruitlets eaten raw or in pies and jams. However, even the leaves of both the cultivated European varieties and the native plants, commonly found along roadsides and in thickets, have important uses. Herbalists recommend raspberry leaf tea for the treatment of diarrhoea, sore throats and colds. Because of its effect as a uterine muscle relaxant and stimulant, this tea has also been used to ease menstrual cramps and childbirth.

Although most of the plants mentioned above are introduced exotics that are ornamentals in our gardens or have become widespread weeds, there are many common native plants that have been used as traditional medicines by various native cultures and subsequently adopted by early settlers.

Spring wildflowers such as red trillium (*Trillium erectum*), also known as birthwort, and blue cohosh (*Caulophyllum thalictroides*), known as papoose root, were used as aids in childbirth. Wild ginger (*Asarum canadense*) was used for relieving excess intestinal gas. Bloodroot (*Sanguinaria canadensis*), because its colourful red sap corrodes living tissue, was used to treat superficial skin cancers and fungal growths such as ringworm. A sedative was derived from yellow lady's-slipper orchids (*Cypripedium calceolus*). The native horseweed (*Conyza canadensis*), an aster-like plant also called Canadian fleabane, has haemostatic properties, that is, it can stop the flow of blood. It also produces a turpentine-like oil that acts as an insect repellant.

Dr. D.R. Gunn

yellow lady's-slipper

There are hundreds of plants in Canada's flora of 3300 native plants and 900 introduced exotics that have some interesting uses. Some of these are as close as your doorstep.

Erich Haber
Research Division